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ABSTRACT

This information packet presents materials which focus on early identification of hearing impairment in infants and young children to prevent speech and language delays. A glossary of terms is followed by a summary of results of the National Institutes of Health Consensus Development Conference (1993) concerning early identification of hearing impairment in infants and young children. The next item is a statement of recommendations of the National Institute on Deafness and Other Communication Disorders working group on early identification of hearing impairment and addresses acceptable protocols for use in state-wide universal newborn hearing screening programs. The packet also includes two article reprints: (1) "Early Screening: A Promise for the Future" (Lorraine Short); and (2) "Hearing and the Development of Language and Speech" (Leo V. Deal and William H. Haas). A list of 10 additional resource organizations follows. Next are answers to seven frequently asked questions about Combined Health Information Database information searches. An abstract bibliography of 25 items completes the packet. Contains 25 references. (DB)

Hearing Loss in Children: Delayed Speech and Language

Information Packet

NIDCD
Information Clearinghouse
National Institute on
Deafness and Other
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The National Institute on Deafness and Other Communication Disorders (NIDCD) established the NIDCD Information Clearinghouse in 1991. The clearinghouse is a resource for health information on hearing, balance, smell, taste, voice, speech, and language. The clearinghouse provides information and materials to health professionals, the public, and consumers. To receive a publication list and information on our services or to request information on a specific topic, contact our staff.

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Hearing Loss in Children: Delayed Speech and Language Information Packet

The materials in this information packet focus on early identification of hearing impairment in infants and young children to prevent speech and language delays. This background information is not intended to be used for diagnostic or treatment purposes. A doctor or other health care professional must be consulted for diagnostic information and advice regarding hearing impairment and speech and language disorders in children.

Contents

Glossary of Terms

Articulation Disorder - inability to correctly produce speech sounds (phonemes) because of imprecise placement, timing, pressure, speed, or flow of movement of the lips, tongue, or throat.

Assistive Devices - technical tools and devices such as alphabet boards, text telephones (TT/TTY), or text-to-speech conversion software used to assist people with physical or emotional disorders to perform actions, tasks, and activities.

Audiologist - health care professional who is trained to identify and measure hearing impairments and related disorders, including balance (vestibular) disorders and tinnitus, and to rehabilitate individuals with hearing impairment and related disorders. An audiologist uses a variety of tests and procedures to assess hearing and balance function.

Auditory Brainstem Response (ABR) test - a test for brain functioning in comatose, unresponsive, etc., patients, and for hearing in infants and young children, that involves attaching electrodes to the head to record electrical activity from the hearing nerve and other parts of the brain.

Auditory Nerve - eighth cranial nerve that connects the inner ear to the brainstem.

Auditory Perception- ability to identify, interpret, and attach meaning to sound.

Auditory Prosthesis - device that substitutes or enhances the ability to hear.

Aural Rehabilitation - techniques used with persons who are hearing impaired to improve their ability to speak and to communicate.

Central Auditory Processing Disorder - inability to differentiate, recognize, or understand sounds in individuals with normal hearing and intelligence.

Cochlea - snail-shaped structure in the inner ear that contains the organ of hearing.

Cognition - thinking skills that include perception, memory, awareness, reasoning, judgment, intellect, and imagination.

Conductive Hearing Impairment - hearing loss caused by dysfunction of the outer or middle ear.

Cued Speech - method of communication that combines speech reading with a system of handshapes placed near the mouth to help deaf or hard of hearing individuals differentiate words that look similar on the lips (e.g., bunch vs. punch) or are hidden (e.g., gag).

Ear Infection - presence and growth of bacteria or viruses in the ear.

Hair Cells - sensory cells of the inner ear, which are topped with hair-like structures, the stereocilia, and which transform the mechanical energy of sound waves into nerve impulses.

Hearing - series of events in which sound waves in the air are converted to electrical signals that are sent as nerve impulses to the brain where they are interpreted.

Hearing Aid - electronic device that brings amplified sound to the ear. A hearing aid usually consists of a microphone, amplifier, and receiver.

Hearing Disorder - disruption in the normal hearing process whereby sound waves are not converted to electrical signals and nerve impulses are not transmitted to the brain to be interpreted.

Hereditary Hearing Impairment - hearing loss passed down through generations of a family.

Inner Ear - part of the ear that contains both the organ of hearing (the cochlea) and the organ of balance (the labyrinth).

Language - system for communicating ideas and feelings using sounds, gestures, signs, or marks.

Language Disorders - any of a number of problems with verbal communication and the ability to use or understand thesymbol system for interpersonal communication.

Learning Disabilities - childhood disorders characterized by difficulty with certain skills such as reading or writing in individuals with normal intelligence.

Middle Ear - part of the ear that includes the eardrum and three tiny bones of the middle ear, ending at the round window that leads to the inner ear.

Misarticulation - inaccurately produced speech sound (phoneme) or sounds.

Otitis Media - inflammation of the middle ear caused by infection.

Otitis Externa - inflammation of the outer part of the ear extending to the auditory canal.

Otoacoustic Emissions - low-intensity sounds produced by the inner ear that can be quickly measured with a sensitive microphone placed in the ear canal.

Otolaryngologist - physician/surgeon who specializes in diseases of the ears, nose, throat, and head and neck.

Otologist - physician/surgeon who specializes in diseases of the ear.

Outer Ear - external portion of the ear, consisting of the pinna, or auricle, and the ear canal.

Perception (Hearing) - process of knowing or being aware of information through the ear.

Phonology - study of speech sounds.

Postlingually Deafened - individual who becomes deaf after having learned language.

Prelingually Deafened - individual who is either born deaf or who lost his or her hearing early in childhood, before learning language.

Sensorineural Hearing Loss - hearing loss caused by damage to the sensory cells and/or nerve fibers of the inner ear.

Sign Language - language of hand shapes, facial expressions, and movements used as a form of communication. because of muscle weakness or incoordination or difficulty performing voluntary muscle movements.

Speech - making definite vocal sounds that form words to express thoughts and ideas.

Speech Disorder - any defect or abnormality that prevents an individual from communicating by means of spoken words. Speech disorders may develop from nerve injury to the brain, muscular paralysis, structural defects, hysteria, or mental retardation.

Speech-Language Pathologist - health professional trained to evaluate and treat people who have voice, speech, language, or swallowing disorders including hearing impairment, that affect their ability to communicate.

NIH Consensus Development Conference

March 1-3, 1993

Office of Medical Applications of Research

National Institutes of Health

EARLY IDENTIFICATION OF HEARING IMPAIRMENT IN INFANTS AND YOUNG CHILDREN

Approximately one of every 1,000 infants is born deaf. Many more children develop some degree of hearing impairment later in childhood. Any degree of hearing impairment during infancy and early childhood can have devastating effects on speech and language development, affecting learning and social/emotional growth. Furthermore, reduced ability to hear at a young age adversely affects the person's vocational and economic potential.

Despite the consequences of hearing impairment in infants and young children, the average age of identification in the United States is close to three years, well past the critical period for speech and language development. To evaluate current research and provide recommendations regarding hearing assessment from birth through five years of age, the National Institute on Deafness and Other Communication Disorders and the NIH Office of Medical Applications of Research sponsored a Consensus Development Conference on the Early Identification of Hearing Impairment in Infants and Young Children, March 1-3, 1993. Following 1 1/2 days of presentations from experts in relevant fields and audience discussion, a 15-member non-Federal panel weighed the information and developed a consensus statement.

The consensus panel concluded that all infants should be screened for hearing impairment. The panel was able to make this recommendation since recent advances in technology have led to improved screening methods that provide the capability to identify hearing impairments in infants soon after birth.

Currently, the only infants screened are those identified with one or more high risk factors associated with hearing impairment, including low birth weight or a family history of hearing impairment. These criteria, however, fail to identify 50 to 70 percent of children born with hearing impairment.

The screening procedure recommended by the panel would involve first screening the hearing of all infants with a test that measures otoacoustic emissions (OAE's). OAE's are low-intensity sounds produced by the inner ear that can be measured with a sensitive microphone placed in the ear canal. Measurement of OAE's was selected as the first test of the recommended screening procedure since it is a quick, inexpensive, accurate test of hearing sensitivity.

The panel further recommended that infants who fail the OAE screening have additional testing for auditory brain stem responses (ABR) which can confirm the validity of the OAE failure. Those infants who fail ABR should have a comprehensive hearing evaluation no later than 6 months of age.

Because infants admitted to neonatal intensive care units (NICU) have an increased risk of hearing impairment, the panel recommended that these infants' hearing should be screened just before discharge from the hospital. The panel also suggested that infants in the well-baby nursery with a family history of hearing impairment or diagnoses of craniofacial anomalies or intra-uterine infections should have their hearing screened prior to discharge from the hospital.

Furthermore, the panel recommended that the hearing of all other infants be screened within the first three months of life, but added

that this will be achieved most efficiently by screening prior to discharge from the well-baby nursery since the infants are more accessible for testing at that time.

However, the panel cautioned that 20 to 30 percent of hearing impairment in children occurs during infancy and early childhood. Therefore, the panel strongly urged that hearing screening be continued at intervals throughout early childhood. Parental concern should be elicited during well-baby visits to physicians, and speech and language development should be evaluated during those visits using formal assessment tools. Failure to reach appropriate language milestones should result in prompt referral for hearing evaluation. Parental concern expressed about the hearing of their child should be sufficient reason to initiate prompt formal hearing evaluation.

The panel also recommended that children recovering from bacterial meningitis as well as those with a history of significant head trauma, viral encephalitis or labyrinthitis, excessive noise exposure, exposure to ototoxic drugs, congenital-perinatal cytomegalovirus infection, familial hearing impairment, chronic lung disease or diuretic therapy, and children with repeated episodes of otitis media with persistent middle ear effusion have their hearing tested. School entry screening at both public and private schools should continue in order to provide another opportunity for universal identification of children with hearing impairments.

The panel urged future research to evaluate the validity and reliability of screening instruments and to compare various screening procedures for time and cost. The cost effectiveness of universal screening for infant hearing impairment also needs to be investigated. The panel identified the need to develop innovative behavioral audiometry tests that are applicable for screening programs. Furthermore, the panel felt that large-scale studies should be conducted to evaluate the efficacy of early identification and intervention.

Free, single copies of the complete NIH Consensus Statement on the Early Identification of Hearing Impairment in Infants and Young Children may be obtained from the Office of Medical Applications of Research, NIH, Federal Building, Room 618, Bethesda, Maryland 20892, phone 301-496-1143.

Recommendations of the NIDCD Working Group on Early Identification of Hearing Impairment on Acceptable Protocols for Use in State-Wide Universal Newborn Hearing Screening Programs

This document was developed as part of the National Institute on Deafness and Other Communication Disorders (NIDCD) Workshop on Universal Newborn Hearing Screening held in Chevy Chase, Maryland on September 4-5, 1997. Members of the Working Group on Early Identification of Hearing Impairment in attendance at this workshop and who participated in the writing of this document included: G. Pamela Burch-Sims, Ph.D., Tennessee State University; Richard A. Chole, M.D., Ph.D., University of California; Allan Diefendorf, Ph.D., Indiana University School of Medicine; Karen Doyle, M.D., Ph.D., University of California at Irvine; Stephen Epstein, M.D., Wheaton, Maryland; Judith Gravel, Ph.D., Albert Einstein College of Medicine; Deborah Hayes, Ph.D., Children's Hospital, Denver; Linda Hood, Ph.D., Louisiana State University Medical Center; Susan Jerger, Ph.D., The University of Texas at Dallas; Mary Pat Moeller, M.S., Boys Town National Research Hospital; Susan Norton, Ph.D., University of Washington; Beth Prieve, Ph.D., Syracuse University; Patricia Stelmachowicz, Ph.D., Boys Town National Research Hospital; Judith Widen, Ph.D., University of Kansas Medical Center; and Christine Yoshinaga-Itano, Ph.D., University of Colorado.

I. Introduction

The early identification of children with hearing impairment is an important public health objective in the United States. Each year in this country, approximately 1.5 to 3 per 1,000 children are born with significant hearing impairment. With an annual birth rate of approximately 4 million infants, this prevalence rate translates into as many as 33 children per day born with hearing impairment. Currently, many of these children are not identified until the second year of life or later despite advances in the technology available for the early detection of hearing impairment. This delay in identification contrasts with some available statistics from other developed countries where the age of identification has been reduced to less than one year of age. The consequences of a late diagnosis of hearing impairment are significant delays in spoken language and literacy. Without appropriate and timely identification and intervention, early childhood hearing impairment interferes with the development of oral/aural communication, impedes academic performance, and results in long-term vocational consequences.

A National Institutes of Health Consensus Conference held in March of 1993 recommended hearing screening of all newborns, termed universal newborn hearing screening. Access to the largest possible number of newborns is necessary to promote early identification of hearing impairment for all infants and subsequent referral for diagnosis and intervention. The best opportunity for achieving this goal appears to be provided by the development of hearing screening programs for newborns in hospital nurseries or in birthing centers, prior to discharge. The successful implementation of this

pro-active approach should lead to a greater likelihood that a child with hearing impairment will enjoy academic, social, and vocational success. Recent data indicate that the direct cost of universal newborn hearing screening programs is comparable to the direct cost of universal screening programs for other congenital conditions such as hypothyroidism, phenylketonuria (PKU), and hemoglobinopathies.

A variety of current technologies are available to identify hearing impairment in the first days of life. Two of the current methodologies generally established as effective for universal newborn hearing screening are auditory brainstem responses (ABR) and evoked otoacoustic emissions (EOAE). The focus of this document is to recommend acceptable procedures that can be used by States for universal newborn hearing screening. It is important to note, however, that a newborn hearing screening program is only one component of a comprehensive approach to the management of childhood hearing impairment. The process also requires follow-up diagnostic services, counseling, intervention programs, and parental educational programs. This comprehensive process must be administered by a multidisciplinary team consisting of individuals such as audiologists, physicians, educators, speech/language pathologists, nurses, and parents.

II. Current Status of Statewide Systems for Universal Newborn Hearing Screening

The development of statewide systems for universal newborn hearing screening has been addressed by three approaches, namely legislative mandate, voluntary initiative, and federal support. Legislative mandates have been used to initiate some form of newborn hearing screening in approximately 20 states. In four of the states (Rhode Island, Hawaii, Colorado, and Mississippi), the legislation specifically addresses the screening of all newborns. In the 16 remaining states, however, the legislation addresses the identification of risk status in infants, which indirectly identifies a pool of infants who are at-risk for hearing impairment and who should be screened. A limitation of this latter approach is that screening programs restricted to infants with risk factors for hearing impairment identify only 50% of infants with significant hearing impairment. Thus, health care professionals in several states are attempting to initiate hearing screening services for all newborns, including neonates without risk factors. With regard to voluntary initiatives, voluntary programs exist in several of the states without legislative mandates. For example, Wyoming has achieved effective universal newborn hearing screening without legislation. Numerous local voluntary programs within individual communities or hospitals also exist. Finally, with regard to federal support, funds from the Bureau of Maternal and Child Health have allowed 17 states to commit to achieving universal hearing screening by the year 2000. When fully operational, these 17 states will screen more than 1,000,000 newborns a year.

In concert with recommendations of NIH/NIDCD and the Joint Committee on Infant Hearing (JCIH)*, current statewide programs generally employ ABR and/or EOAE for hearing screening. These techniques are physiological measures of the status of the peripheral auditory system that are highly correlated with hearing status. The techniques permit the identification of infants with communicatively significant hearing impairment

without referring large numbers of normally hearing infants for unnecessary follow-up testing.

III. Acceptable Protocols

Acceptable hearing screening protocols should have specific response attributes and measurement characteristics. Some of these desired response and methodological features are the following:

- The response should be robust (i.e., capable of being measured reliably under a wide variety of conditions);
- The response should be dependent upon the integrity of the peripheral auditory system;
- The response should have predictive value (i.e., it should be present in nearly all normal hearing infants and abnormal in nearly all infants with hearing impairment);
- The response should be measured non-invasively;
- The procedure should employ scientifically-based, objective criteria to define both the method for a technically correct screening test and the guideline for a "pass versus refer" rule;
- The procedure should be capable of testing each ear independently;
- The procedure should achieve a low referral rate for additional testing at another session to prevent unnecessary costs and parental anxiety;
- The procedure should be manageable in a hospital or birthing center setting in order to provide access to the greatest number of neonates, thus promoting the universality of hearing screening;
- After the initial screening, and before the infant returns for any recommended follow-up screening, acceptable protocols should attain a referral rate of no more than approximately 5% for neonates with no risk indicators and 8% for infants at risk for hearing impairment. Previous research indicates that these referral rates can be achieved in approximately 6 months with appropriate training and quality control monitoring; and
- The choice of a particular method will vary as a function of the demographic characteristics of the neonates to be screened and available community resources.

Based on a review of published data, a physiological response implemented with objective response criteria best meets the above requirements. Acceptable approaches include: 1) auditory brainstem response (ABR); 2) either transient evoked otoacoustic emissions (TEOAE) or distortion product evoked otoacoustic emissions (DPOAE); or, 3) a combination of OAE and ABR. Future research may yield additional objective, physiological measures that could advance universal newborn hearing screening. A variety of non-auditory factors may influence the outcome of any of the current hearing screening approaches. These include test environment, infant state, infant medical status, and age. The skill and commitment of the examiner are also important factors influencing the screening test results. Studies have documented that the actual screening can be carried out effectively by a wide variety of personnel with appropriate training,

such as nurses or volunteers. Training and quality assurance measures are vital components for the efficiency and overall effectiveness of screening programs.

The initial hearing screening should be carried out before 3 months of age to ensure that intervention can begin between birth and 6 months of age. The initial screening should represent only one component of an overall identification and intervention program for children with hearing impairment. The overall screening program should include provisions for: 1) tracking of infants who are referred from the initial screening; 2) follow-up diagnostic testing; and, 3) intervention for those infants with confirmed hearing impairment. These programmatic goals can best be achieved through a multi-disciplinary approach including, but not limited to, primary health care providers, neonatologists, audiologists, otolaryngologists, educators, speech-language pathologists, psychologists, and parents. In addition, an important determiner of the success of universal hearing screening programs is the effective, timely and sensitive communication of the results and of any necessary follow-up recommendations to parents or other legal guardians and to primary care providers.

Finally, because some hearing impairments develop during early childhood, the Working Group recommends that children continue to be monitored for hearing impairment and that all children undergo hearing screening upon entering school and periodically thereafter.

IV. Summary

As many as 12,000 infants are born each year in the United States with hearing impairment. Many of these children are not identified as being hearing impaired until they are 2 years of age or older. A delay in the diagnosis of hearing impairment leads to delays in language acquisition and academic achievement. Early identification of and appropriate intervention for children with hearing impairment leads to improvements in speech and language development in affected children, thereby improving the likelihood of positive social, emotional, cognitive, and academic development. Identification of and intervention for infants prior to 6 months of age seems to result in the most favorable outcomes. Therefore, the Working Group recommends that a system of universal hearing screening within newborn nurseries be instituted. Universal screening can be achieved with low cost methods that successfully differentiate newborns with hearing impairment from newborns with normal hearing. The chosen screening method should be simple and the response should be reproducible; the method should be capable of being administered by a variety of adequately trained personnel. At the present time, the Working Group concurs that one or more of the following screening strategies are suitable for application to infant screening: 1) auditory brainstem response (ABR); 2) either transient evoked otoacoustic emissions (TEOAE) or distortion product evoked otoacoustic emissions (DPOAE); or, 3) a combination of OAE and ABR. Universal screening of newborns will lead to the referral of more infants for diagnosis and intervention. Comprehensive intervention and management programs are an essential part of a universal hearing screening program.

*Footnote 1. JCIH is a multidisciplinary committee composed of representatives from the American Academy of Audiology, American Academy of Otolaryngology-HNS, American Academy of Pediatrics, American Speech-Language-Hearing Association, Council for Education of the Deaf, and Directors of Speech and Hearing Programs in State Health and Welfare Departments.

Photo courtesy of Grason-Stadler, Inc.

Early Screening: A Promise for the Future

by Lorraine Short, assistant editor

Only about 15 percent of all newborns in the United States are screened for hearing loss before leaving the hospital. Although the importance of early detection is well-established, most babies are not tested within their first months or even years of life. There is a movement underway, though, providing hope for a brighter future for infants with hearing loss.

The single most crucial period for auditory stimulation begins at birth and extends until three years of age. Exposure to sound is absolutely essential as the auditory system continues to mature, while speech and (spoken) language development depend on a baby's ability to hear. Ultimately, healthy social, emotional, and cognitive growth hinge on the evolution of these basics for interaction with others.

Not all babies possess the ability to hear, a situation that obviously can have significant consequences. Of the four million live births each year, it is estimated that slightly more than one in a thousand newborns has a profound hearing loss while as many as six in a thousand have mild-to-moderate hearing impairments. In addition to these congenital conditions, hearing loss acquired in infancy and early childhood, whether temporary or permanent, increases the number of children who experience reduced or lack of exposure to sound.

Early identification and diagnosis of hearing loss is critical because stimulation is so essential. If partial hearing exists, even infants as young as one month can be provided with amplification using the latest and tiniest hearing aids. In instances of profound sensorineural deafness, cochlear implants might be considered in children as young as age two. Early exposure to sign language also provides building blocks for acquisition of language. In all cases, early intervention programs can be implemented. Parents and caregivers can learn methods to maximize interaction with hearing-impaired infants, introducing them to the basics of communication.

Although for over 50 years experts have emphasized the need for early detection of hearing impairment in infants, it has been a difficult task. Historically, identification has depended primarily on observation; consequently, children slipped by unnoticed until language was delayed. Even today, the average age of identification of congenital or early-onset hearing loss is around two and one-half years. Milder cases often escape detection until school age, leaving children open to misdiagnosis. Far too frequently, these children are labeled learning disabled.

We are, however, in the midst of dramatic changes. The groundwork for these advances was laid by Marion Downs, an audiologist who pioneered the concept of universal newborn hearing screening (UNHS) in the 1960s. Other professionals, including audiologists, otolaryngologists, speech pathologists, pediatricians, and health agency workers, formed the Joint Commission on Infant Hearing Screening in 1969 to help drive and direct the development of UNHS. Lagging technology and lack of resources made the success of the mission seem remote, if not impossible. But the Joint Commission persisted, monitoring developments in testing and screening of infants and children in "high-risk" groups.

A breakthrough came with the introduction and refinement of new screening tests during the 1980s. The new technology coupled with a 1989 pronouncement by then Surgeon General C. Everett Koop provided the final impetus to make UNHS a reality. Koop set a goal that by the year 2000, all infants with a significant hearing loss would be identified by 12 months of age. Momentum began to build. In March 1993, the National Institutes of Health (NIH) held a consensus development conference. The outcome was a blueprint for achieving Koop's goal and more.

Members of the NIH panel: concluded that new testing tools provided the first realistic opportunity for UNHS; recommended that all infants be screened by three months of age (ideally, prior to hospital discharge); and stated that all hearing-impaired infants should be identified and their treatment programs initiated by six months of age. Pointing out that UNHS does not replace the need for ongoing

surveillance, the consensus statement encouraged increased education of caregivers, educators, and healthcare providers on early signs of hearing loss. Finally, the panel members called for school-entry screening as another opportunity for detecting significant hearing loss.

What are these innovative testing techniques that were prerequisites for progress? Actually, by the time of the 1993 NIH statement, auditory brainstem response (ABR) testing had been in use for 15 years. Designed to measure electrical signals caused by nerves firing in response to sounds presented through headphones, the ABR was originally quite costly and time-consuming to use. However, advances in design had only recently resulted in automated ABR (AABR) systems. As sensitive as its predecessors, AABRs are more cost-effective, eliminate the necessity for highly-trained technicians, and are now widely used in screening infants in the first 48 hours of life.

A second breakthrough in technology recognized by the NIH panel involves testing for evoked otoacoustic emissions (EOAE). This screening tool is based on a 1978 discovery that a healthy cochlea generates small but detectable sounds (otoacoustic emissions) as a result of auditory stimulation. Presence of the sounds in response to clicks or tones used during the test indicate healthy inner ear and middle ear functioning. EOAEs are a rapid, cost-effective screening method and are often the initial screening tool used in UNHS programs.

After the NIH consensus statement proposed the feasibility and desirability of UNHS, the growth of programs has been great, rising from just 12 hospitals in 1993 to an estimated 250 by the end of 1996. Several states have embarked on systematic, statewide screening and are testing a majority of newborns. A select few are approaching the benchmark of UNHS: 85 to 90 percent of newborns. The current national rate of 15 percent rate is, unfortunately, far off the mark.

Ultimately, much of the success will depend on the legislative process. At the National Center for Hearing Assessment and Management, which champions the goal of establishing UNHS as an accepted, national standard of care, observers feel that the rapid growth of programs and their success "make it politically viable to consider legislative mandates." Even in states that are well on the way to achieving the 85 percent rate, legislation secures the future of UNHS, protecting against policy or ownership changes at hospital facilities that have programs in place. Resources and funding for rural or disadvantaged areas may depend on federal, state, or local grants which often require legislative mandates. Although at least one hospital in as many as 31 states has voluntarily established UNHS, and many more are joining the ranks daily, legislation insures that all babies and families will benefit from early screening.

The Leaders in Newborn Screening

✓ **UNHS Legislation**
Hawaii *(1990)*
Rhode Island *(1992)*
Mississippi *(1997)*
Colorado *(1997)*
Massachusetts *(pending)*
Pennsylvania *(pending)*

✓ **Considering UNHS Legislation**
Connecticut
Minnesota
Oregon
West Virginia
Utah
New York

✓ **Extensive Voluntary UNHS Programs**
Rhode Island, Hawaii, Colorado, Delaware, Iowa, Utah, Wyoming, Guam

In the meantime, for those infants who are not yet being screened in the first few days of life, there are no standard programs in place to detect hearing loss. Some physicians and clinics include screening at the first well-baby visit, but in most areas, testing is provided only to infants considered to be at high risk due to maternal illness, genetic background, or medical condition. It is estimated that testing only high-risk cases will miss 50 percent or more of children with impaired hearing in early childhood. Considering the powerful impact of lack of auditory stimulation during development, clearly that is not good enough. It is essential that parents and other caregivers are vigilant in watching for warning signals, as they are the first line of defense for avoiding the consequences of undetected hearing loss.

Many daycare and Headstart programs have screening programs beginning at age three. Certainly that is a promising trend for catching undetected hearing losses. Although beyond the critical early period of development, intervention at this age can certainly help the child and family improve communication skills, counter language delays, and prepare for academic success.

Screening protocol in school-age children is far from universal. Although some states have a legislated schedule, most do not. Recent guidelines for pediatric screening issued by the American Speech-Language-Hearing Association call for annual testing in grades kindergarten through third, seventh, and eleventh. They also recommend testing children with frequent ear infections or similar respiratory conditions that may be causing repeated episodes of temporarily reduced hearing. The sooner impaired hearing is identified, the sooner educators, audiologists, and families can help students make adjustments that benefit their education.

Predictions are that, with a national commitment to UNHS, we will reach the goal of testing all babies for hearing loss by the year 2000. Certainly, there is work left to be done within local communities and state legislatures. These efforts are sure to be bolstered by a new emphasis at the national level which is anticipated within weeks. Secretary of Health and Human Services Donna Shalala is expected to unveil her Children's Health Initiative which, although still in the drafting stages, is reported to include a very strong call for UNHS. When we answer that challenge, we will be offering the babies of the new century one more safeguard for a brighter future.

NATIONAL RESOURCE CENTERS

National Center for Hearing Assessment and Management
Utah State University, UMC 2880
Logan, UT 84322-2880
801-797-3589 (V), 801-797-1448 (Fax)
www.usu.edu/~ncham

Marion Downs National Center for Infant Hearing
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Hearing and the Development of Language and Speech

Key Words
Hearing · Language development · Speech development

Abstract

The criticality of hearing is discussed in relation to language and speech development in children. The fundamentals for such development, the significant milestones in normal language and speech acquisition, and a delineation of the deleterious effects of significant hearing loss on the development of expressive and receptive oral communication are presented.

Gehör, Sprach- und Sprechentwicklung

Der Einfluss des Gehörs auf die Sprach- und Sprechentwicklung des Kindes wird diskutiert. Die Grundlagen einer solchen Entwicklung, die signifikanten Eckdaten eines normalen Sprach- und Sprecherwerbs sowie der ungünstige Einfluss eines bedeutenden Hörverlustes auf die rezeptiven und expressiven Leistungen der mündlichen Kommunikation werden vorgestellt.

Audition et développement du langage et de la parole

L'intégrité de l'audition est nécessaire pour l'acquisition du langage et de la parole, car l'enfant apprend à communiquer oralement à l'écoute de la parole des autres. L'importance de l'audition est appréciée en comparant l'habilté langagière des enfants présentant un handicap d'audition et ceux ayant un appareil auditif reproduisant le langage tel qu'ils l'entendent. Les possibilités d'expression verbale sont conditionnées avant tout par l'âge d'apparition de la surdité et par son degré.

The ability to share thoughts, desires, ideas, and emotions is what separates humans from other animals. Humans seem to have an innate desire to share experiences with others. Although there are many forms in which this sharing can take place, for most people that sharing primarily takes the form of a spoken language. But to have that sharing be successful, there has to be a receiver who understands those thoughts and experiences; someone has

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to receive the message. It also requires that there is a shared code between speaker and listener. If there is to be a clear exchange of information, there must be a clearly formed message, a means of transmitting that message, and in intact receiving (auditory) system.

With normal hearing and cognitive systems, and with functional oral physiology for speech production, the above scenario readily occurs. The integrity of these systems provides the bases for learning language and speech. The profundity of these bases is more clearly understood when a comparison is made between the language and speech competencies of children who have intact systems with those who do not. Problems with these systems will impede normal language and speech development. Difficulty in hearing can cause a breakdown in communication. Limited hearing can significantly affect language and speech development.

Normal Systems and Processes

The Chinese sage Chuang Tzu [1] suggested that 'Children do not learn to speak because they are taught by professors the art but because they live among people who themselves speak'. At birth an infant with normal hearing can hear all the sounds in the environment. But sound, in itself, does not carry associated meaning. Within weeks after birth, however, associations about sounds are learned. By the end of the first year of life the normal-hearing child understands many words and begins to say them. During the first 2 years children learn to understand language and speech because they are immersed in it. They then begin to speak themselves because of the close association with people within their environment who talk to them. Around 2 years of age they begin to use language and speech for communication in a social environment.

The preceding is a synopsis, albeit brief, of how a child with normal hearing develops language and speech. What follows is an explication of some of the major elements that serve as fundamentals for such development, the significant milestones in normal language and speech acquisition, and a delineation of the deleterious effects of significant hearing loss on the development of expressive and receptive oral communication.

Fundamentals for the Development of Effective Oral Communication

Communication may be defined as the act of passing information from one place to another by any means. In the case of spoken communication, it is transmitted from a speaker to a listener. Accordingly, hearing-language-speech are critical components of spoken communication.

Language is a system of symbols which, when arranged in a particular order, may be used to comprehend or express thoughts, ideas, desires, and emotions among whom the symbols have shared meaning. Language is operationalized through the study of semantics (the words chosen), morphology (the form of the words), syntax (the ordering of the words), phonology (the sounds within words), and pragmatics.

As the desire to communicate develops within a speaker, there is a certain 'attitude' associated with the desire. Some might label this attitude 'pragmatics' or 'psycholinguistics'. It is the 'mind set' of the speaker prior to and during the development and production of a message. On the basis of the speaker's attitude a *message* is developed. The message is based on a knowledge of the language and a grammatical system that includes semantics, morphology, syntax, and phonology.

Speech is the sound system of language and is dependent upon respiration, phonation, articulation, resonance, and suprasegmentals such as rate, rhythm, pitch, loudness, stress, melody, pauses. Production of the message also provides *feedback* to the speaker. As we speak, we monitor what we say and how we say it. Feedback is critical for the young child in 'fine-tuning' motor speech skills.

Hearing is the reception of sound waves by the auditory systems, and it is the primary means for learning and processing language and speech. Children produce speech essentially as they hear it. Processing requires detection, discrimination, identification/recognition, and comprehension of auditory events. The spoken message transmitted in the medium of air arrives at the listener's ears and is initially processed by the peripheral hearing mechanism (external, middle, and inner ears). Once the message has been received and processed into a message, it is analyzed by the language system: the semantics, morphology, syntax, and phonology of the code. The message then is interpreted according to the listener's existing 'attitudes'.

Milestones of Normal Language and Speech Acquisition

Young children with normal hearing typically accomplish the following major milestones in the development and production of language and speech [2]:

- During the first 6 months infants develop prespeech vocal skills through practice afforded by crying, cooing, babbling, echoing.
- By 9 months the child has developed a sense of pitch and intonation – the emergence of the ability to use stress patterns.
- By 12 months certain pivotal words emerge which have associated meaning.
- By 2 years of age the child connects words into phrases.
- By 3 years of age the child's speech is essentially intelligible to most adults, the child uses several phrases and sentences.
- By 4 years of age the child uses about 90% of the grammatical concepts of English in a correct fashion.
- By 5 years of age the child has a receptive vocabulary of 6,000–10,000 words.
- By age 7 a child has learned to produce correctly most, if not all, of the speech sounds of the language.

The Effects of Hearing Loss on Language and Speech Development

Because sensorineural hearing loss is typically more detrimental to high-frequency hearing than low-frequency hearing, the following classical observations are significant in the understanding of the impact hearing loss has on the learning and subsequent understanding of language and speech [3–5].

Assuming that 1,000 Hz is an acceptable point for dividing high-frequency hearing from low-frequency hearing, most consonant sounds fall primarily within the higher frequency range and provide the greatest amount of intelligibility (understanding). Speech sounds produced with critical energy above 1.000 Hz provide about 60% of intelligibility in conversational speech.

Only a small amount of overall speech energy (power) can be accounted for, however, in the frequency range above 1,000 Hz. Most of the speech energy is found with the vowel sound production and is essentially represented by low-frequency composition.

The speech power spread for the production of all English speech sounds is about 28–30 dB. That is, the speech sound with the greatest relative power is 28–30 dB more powerful than the weakest. ([a] as in father is generally considered the strongest pho-

Folia Phoniatr Logop 1996;48:111–116

neme and the voiceless [th] as in thin, the weakest.)

Average conversation is typically produced between 60 and 65 dB SPL.

Vocal intensity of a speaker, the nature of speech production acoustics, the distance between speaker and receiver are mediated through the favorable or unfavorable nature of the listening environment – especially concerning the level and type of ambient noise and the reverberational characteristics of the environment.

What the above tells us is that the acoustics of the speech code is not conducive for the understanding of speech in noisy listening situations and for persons with high-frequency hearing loss. For many years it was felt that language and speech development in a child with limited hearing would not be affected unless the loss was at least moderate or moderate to serve. Now we know that even a mild loss – even a temporary one – can affect the normal development of language and speech [6]. A child with a prelingual hearing loss will have significantly greater language and speech difficulties than the child who acquires a hearing loss postlingually.

Other factors that weigh heavily in the determination of the impact of hearing loss on language-speech learning are age at onset of hearing loss, degree and type of hearing loss, age at initial use of amplification or cochlear implant, age when intervention program is initiated, intensity and quality of intervention, degree of involvement of support from family and professionals, consistency and quality of amplification or cochlear implant, and presence of other handicapping conditions.

It is generally accepted that as the degree of hearing loss increases, so do the associated language-speech problems. Children with hearing losses differ essentially from persons with normal hearing in the frequency of consonant speech production errors rather than the type of errors. However, vowel production errors do differ and are more frequent in persons with significant hearing loss than those with normal hearing. Suprasegmental patterns are also affected in a significant way [2, 7, 8].

The *suprasegmental* problems of persons with significant hearing loss are manifested by speech that sounds labored and poorly controlled. The complex time relationships of connected phoneme production suffer from faulty breath groupings, syllable productions, inappropriate vocal intensity and pitch. *Vowel production* is often faulty with a tendency to incorporate inappropriate nasal resonance. Vowels are often neutralized so they tend to sound alike. This lack of differentiation may be due to the inability to hear the critical second formant of some of the vowels. Diphthongization of vowels occurs regularly. Deletions and substitutions of *consonant sounds* are common. Insertion of the schwa vowel, and syllable and cluster reductions or deletions are also prevalent. *Language competence* (inner language) and expressive language performance, like speech production, also are usually affected in direct relation to the degree and onset of the hearing loss. The development of language is difficult, at best, as hearing loss provides fragmented information causing impaired ability to store and receive information. This, in turn, has a negative impact on the efficiency of the auditory feedback loop. Studies show there is typically a 2-year language delay for hard-of-hearing children and up to 5 years for those classified as deaf. Multiple meanings of words, the meanings of silences by speakers, abstract concepts and figurative language, proverbs, idioms, slang, and colloquialisms, morphological markers, and the nuances of inflections used by speakers all present decoding obstacles for the hearing-impaired listener [2, 7, 8].

Hard-of-hearing children (losses less than 80–90 dB HTL) learn their language and speech primarily through the sense of hearing, just like normal-hearing children. As severity of the hearing loss increases, more and more reliance is placed on visual processing of information through lipreading. *Deaf* children (losses in excess of 85–90 dB HTL), however, do not learn language and speech via the auditory modality even with optimal personal amplification. For these children, the primary avenues are visual, tactile, and kinesthetic.

With amplification, children with *mild hearing losses* (26–40 dB) may miss up to 30% of speech information presented in a typical noisy environment. Faint speech presented at a significant distance will affect the recognition of voiceless, high-frequency consonants. Regardless, children in this category of hearing loss have good potential to learn language and speech without substantial difficulty, albeit more slowly than their normal-hearing peers. Persons with *moderate ot moderately severe hearing losses* (41–65 dB) understand conversational speech only if structure and vocabulary are controlled and if the distance from the speaker does not exceed 3–5 f. Without amplification 50–70% of information transmitted may be missed when a hearing loss of around 40 dB is presented, and 80–100% may be missed for losses around 50 dB. For children showing losses between 40 and 50 dB, delayed and faulty syntax can be predicted along with limited vocabulary, imperfect speech production, and atonal voice quality. Children with losses between 50 and 70 dB have significant difficulty with verbal learning. Delayed language, poor speech intelligibility, and poor voice quality are typical. Only with optimal amplification will a child with *severe hearing loss* (70–90 dB) be able to identify environmental sounds and detect most speech sounds. In cases of prelingual onset of hearing loss, oral language and speech most likely will not develop spontaneously and will have to be taught. Children with *profound hearing losses* (90 dB or more) may hear some loud sounds, but they are more aware of vibrations and will primarily depend on visual learning. Language and speech will not develop without substantial instruction and struggle. At best, language and speech will be severely delayed with suprasegmentals produced in an unnatural manner [2, 7, 8].

Summary

The integrity of the auditory system is necessary for the normal acquisition of language and speech because children learn oral communication by hearing others speak. The criticality of hearing is readily appreciated when comparisons are made between the language and speech skills of those with hearing impairment and those with intact auditory systems. Children with hearing loss produce speech essentially the way they hear it. Language and speech competency is constrained primarily by age of onset and degree of hearing loss.

Additional Resources

This is a list from the NIDCD Directory of Information Resources for Human Communication Disorders of national organizations that focus on health issues relating to hearing, speech, and language. For a full description of each organization you may wish to search the directory online at <www.nih.gov/nidcd> or request a copy of the directory by contacting an information specialist at the NIDCD Information Clearinghouse.

American Academy of Audiology (AAA)
Address: 8201 Greensboro Drive, Suite 300
McLean, VA 22102
Voice/TTY: (703) 610-9022
Toll Free: (800) AAA-2336
Fax: (703) 610-9005
Internet: www.audiology.com

American Academy of Otolaryngology/Head and Neck Surgery (AAO-HNS)
Address: One Prince Street
Alexandria, VA 22314
Voice: (703) 519-1589
TTY: (703) 519-1585
Fax: (703) 299-1125
E-mail: entinfo@aol.com
Internet: www.entnet.org

American Society for Deaf Children (ASDC)
Address: 1820 Tribute Road, Suite A
Sacramento, CA 95815
Voice/TTY: (916) 641-6084
Toll Free: (800) 942-ASDC
Fax: (916) 641-6085
E-mail: ASDC1@aol.com
Internet: www.deafchildren.org

American Speech-Language-Hearing Association (ASHA)
10801 Rockville Pike
Rockville, MD 20852
Voice: (301) 897-5700
TTY: (301) 897-5700
Toll Free: (800) 638-8255
Fax: (301) 571-0457
E-mail: actioncenter@asha.org
Internet: www.asha.org

Additional Resources (continued)

Beginnings for Parents of Hearing Impaired Children (Beginnings)
Address: 3900 Barrett Drive, Suite 100
Raleigh, NC 27609
Voice/TTY: (919) 571-4843
Toll Free: (800) 541-4327
Fax: (919) 571-4846

Center for Hearing Loss in Children (CHLIC)
c/o Boys Town National Research Hospital
Address: 555 North 30th Street
Omaha, NE 68131
Voice: (402) 498-6511
TTY: (402) 498-6543
Toll Free: (800) 282-6657
Fax: (402) 498-6638
E-mail: CHLIC@boystown.org
Internet: www.boystown.org/chlc

Council for Exceptional Children (CEC)
Address: 1920 Association Drive
Reston, VA 20191-1589
Voice: (703) 620-3660
TTY: (703) 264-9446
Toll Free: (888) CEC-SPED
Fax: (703) 264-9494
E-mail: cec@cec.sped.org
Internet: www.cec.sped.org

John Tracy Clinic
Address: 806 West Adams Boulevard
Los Angeles, CA 90007
Voice: (213) 748-5481
TTY: (213) 749-2924
Toll Free: (800) 522-4582
Fax: (213) 749-1651

Additional Resources (continued)

National Information Center for Children and Youth with Disabilities (NICHCY)
Address: P.O. Box 1492
Washington, DC 20013-1492
Voice/TTY: (202) 884-8200
Toll Free: (800) 695-0285
Fax: (202) 884-8441
E-mail: nichy@aed.org
Internet: www.aed.org/nichcy

Self Help for Hard of Hearing People, Inc. (SHHH)
Address: 7910 Woodmont Avenue, Suite 1200
Bethesda, MD 20814
Voice: (301) 657-2248
TTY: (301) 657-2249
Fax: (301) 913-9413
E-mail: national@shhh.org
Internet: www.shhh.org

May 1998

Frequently Asked Questions About CHID Searches

Q: What is CHID?
A.The Combined Health Information Database (CHID) is a reference tool that leads health professionals, patients, and the general public to thousands of journal articles and patient education materials that contain information about different health topics.

Q: What type of information is in this search?
A: The information contained in this search is from the Deafness and Communication Disorders subfile of CHID. CHID has 18 subject areas or "subfiles." Each of these subfiles is a rich source of hard-to-find literature that is not often referenced in other databases. For example, brochures or newsletters produced by patient-advocacy organizations, or booklets produced by Federal health agencies are items listed in CHID. Health literature and educational resources for special populations are other examples of items found in CHID.

Q: What does a search from CHID contain?
A: Each item or record is listed in the search alphabetically by the title of the material (TI). Also contained is the author (AU), source of the information (SO), and availability of the information (AV) so that you may contact the appropriate organization to acquire the item. An abstract (AB) briefly describes the item and its subject content.

Q: If an item is included in CHID, does that mean it has received an endorsement from the producers of CHID?
A: Inclusion of an item in CHID or reference to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply endorsement, recommendation, or favoring by the U.S. Government, NIH, or any of their employees or contractors. You are strongly advised to check any medical treatments or information with your health care provider.

Q: Can I conduct my own searches?
A: If you have access to the Internet, CHID and the Deafness and Communication Disorders subfile are available online at <chid.nih.gov>. Access to the database is free.

Q: Are any of the materials in the search available from the NIDCD Information Clearinghouse?
A: Unless the NIDCD Information Clearinghouse is cited as the source, these items are **not** available from the clearinghouse. The full-text materials are available from their respective sources, as noted under "Availability" for each item in the database.

Q: What should I do if I have questions about my search?
A: Please contact the clearinghouse at (800) 241-1044 (Voice), (800) 241-1055 (TTY), or email us at nidcd@aerie.com. Information Specialists are available to assist you and provide a custom search.

CHID is produced by a consortium of Federal health agencies, including the Centers for Disease Control and Prevention and the National Institutes of Health. The Government institutes and centers select and abstract new materials for inclusion in CHID regularly throughout the year.

Hearing Loss In Children: Delayed Speech And Language

Document 1

TI **About Children with Special Needs.**

SO South Deerfield, MA: Channing L. Bete Company, Inc. 1997. 16 p.

CN Channing L. Bete Company, Inc.

AV Available from Channing L. Bete Company, Inc. 200 State Road, South Deerfield, MA 01373-0200. (800) 628-7733; Fax (800) 499-6464; http://www.channing.bete.com. PRICE: $1.25 each for 1-24 copies; bulk rates available. Item Number 167661-5-94.

AB This booklet describes children with 'special needs', which is defined as a disability or combination of disabilities that makes learning or other activities difficult. Special needs children include those who have mental retardation, speech and language impairments, physical disabilities, learning disabilities, and emotional disabilities. Topics covered include the importance of becoming aware of children's special needs, the role of early diagnosis and attention (intervention), the average timetable of gross motor development annually from age one through age five, the average timetable of mental development, the symptoms of sight and hearing disorders in children, what to do when a problem is suspected, and strategies for parents helping their children learn and grow. The booklet includes a section describing the legal rights of children with disabilities and the importance of parental involvement in the child's education and growth. The booklet also mentions the legal protections afforded adults with disabilities, including their rights under the Americans With Disabilities Act (ADA). The booklet includes many cartoon-like line drawings illustrating children and adults in a variety of settings.

Document 2

TI **Advances in Early Detection of Hearing Loss in Infants.**

AU Eilers, R.E.; Berlin, C.

SO Current Problems in Pediatrics. 25(2): 60-66. February 1995.

AV Available from Mosby-Year Books, Inc. 11830 Westline Industrial Drive, St. Louis, MO 63146-3318. (800) 453-4351; (314) 453-4351; Fax (314) 432-1158.

AB This article discusses recent advances in the early detection of hearing loss in infants. Topics covered include hearing loss and the 'risk register' approach to detection; risk registers beyond the newborn period; hearing loss associated with congenital cytomegalovirus (CMV); risk factors associated with bacterial meningitis; the role of parental concern in the early identification of children with hearing loss; diagnostic tests used with infants and very young children; the detection of hearing impairment in populations not considered at risk; canonical babbling; the detection of conductive hearing loss; and the importance of early detection. 34 references.

Document 3

TI **American Speech-Language-Hearing Association Answers Questions About Child Language.**

SO Rockville, MD: American Speech-Language-Hearing Association (ASHA). 199x. [2 p.].

CN American Speech-Language-Hearing Association.

AV Available from American Speech-Language-Hearing Association. ASHA Product Sales, 10801 Rockville Pike, Rockville, MD 20852-3279. (800) 897-5700, ext 218; Fax (301) 897-7358. PRICE: Single copy free; bulk orders available. Item Number 0210116.

AB This brochure answers common questions about language development in children. Written in a question and answer format, the brochure addresses the importance of language and communication in human interactions, how children learn language and language rules, how parents can help their child learn to talk, expected language behaviors for different ages, the impact of hearing problems on speech and language development, physical causes of language disability, when to consult a health care provider about language development concerns, speech language therapy, and how to find a speech language pathologist. The contact information for the American Speech Language Hearing Association (ASHA) is provided.

Document 4

TI **Are You Listening to What Your Child May Not Be Saying?**

SO Chicago, IL: National Easter Seal Society. 199x. [4 p.].

CN National Easter Seal Society.

AV Available from National Easter Seal Society. 230 West Monroe, Suite 1800, Chicago, IL 60606. (312) 726-6200; TTY (312) 726-4258; Fax (312) 726-1494. PRICE: Single copy free.

AB This brochure helps parents identify early warning signs that their child may have a developmental problem. The brochure stresses that recognizing problems early and seeking assistance can reduce the potential impact of developmental problems. The brochure lists the early warning signs in seven categories: hearing, thinking, moving, seeing, talking, playing, and living skills. The brochure notes specific tasks in each category that a child should be exhibiting at different ages. The brochure concludes by reiterating that the earlier a problem is identified and the earlier a child gets professional support, the greater the chance that the child can be helped. The brochure is illustrated with black and white photographs of young children.

Document 5

TI **Articulation Issues.**

AU Martin, K.L.

SO In: Martin, K.L. Does My Child Have a Speech Problem? Chicago, IL: Chicago Review Press. 1997. p. 17-35.

AV Available from Chicago Review Press. 814 North Franklin Street, Chicago, IL 60610. (312) 337-0747; Fax (312) 337-5985. PRICE: $16.95 plus shipping and handling. ISBN: 1556523157.

AB This chapter on articulation issues is from a guide that helps parents and teachers identify normal speech development and potential speech and language problems in children. Articulation is defined as the ability to speak clearly and intelligibly. Articulation is considered a motor act, which means the muscle movement is involved. If a child has difficulty in controlling or coordinating the organs of speech to produce the sounds of her native language, she is said to have an articulation problem or disorder. The chapter is written in a question-and-answer format, covering topics including identifying articulation problems, the age at which mastery of certain speech sounds should be achieved, consonant production and placement, when speech therapy is warranted for articulation problems, the causes of articulation problems, normal articulation errors, the relationship between articulation development and middle ear infections, the relationship between dentition and articulation errors, modeling or imitating speech problems of other children, and the relationship between articulation skills and a sensorineural hearing loss. After each section, the author offers related strategies for the parents to employ.

Document 6

TI **Beyond the Child: Hearing Impairment and the Family.**

AU Atkins, D.V.

SO Volta Voices. 2(5): 14-22. September-October 1995.

AV Available from Alexander Graham Bell Association for the Deaf. 3417 Volta Place, N.W., Washington, D.C. 20007. Voice/TTY (202) 337-5220; Fax (202) 337-8314.

AB This article stresses the role of hearing, speech, and language professionals in helping parents to cope with parenting children who are hearing impaired. Topics covered include the need to address the family environment in any program of intervention; the emotions that may affect parents of deaf children; the role of motivation in learning; using natural situations to encourage language growth and auditory function; child development; the importance of parental support groups; the role of the professional as liaison between parent and adults who are hearing impaired; the multicultural aspects of having a child with a disability; early identification and intervention; the parents' role in teaching and education of hearing impaired children; the need for professionals to become empathic, active listeners; family dynamics, particularly regarding siblings; developing a team relationship with parents; and how the clinician's role, like the parents', changes over time. One sidebar summarizes guidelines for working with families of children who have hearing impairments. 16 references.

Document 7

TI **Can Your Baby Hear?**

AU Martin, P.F.

SO Hearing Health. 12(5): 18-21, 42. September-October 1996.

AV Available from Voice International Publications, Inc. P.O. Drawer V, Ingleside, TX 78362-0500. Voice/TTY (512) 776-7240; Fax (512) 776-3278; http://www.hearinghealthmag.com.

AB This article familiarizes new parents with the symptoms of hearing loss in young infants. Topics include the development of listening skills in babies, the refinement of the sense of hearing in the first few months, the development of speech, the need for universal hearing screening of newborns, hearing evaluation tests (automated auditory brainstem response screening, or ABR, and otoacoustic emissions screening, OAE), risk factors for hearing loss, symptoms of early hearing or speech development problems, working with an audiologist, and the differences between conductive and sensorineural hearing losses. One sidebar notes age-appropriate hearing behavior for babies from birth to 18 months; another lists the telephone numbers of resource organizations through which parents can get more information. 4 figures.

Document 8

TI **Children with Deafness or Hearing Impairments.**

SO Springfield, IL: Illinois Early Childhood Intervention Clearinghouse. May 1997. 26 p.

CN Illinois Early Childhood Intervention Clearinghouse.

AV Available from the Illinois Early Childhood Intervention Clearinghouse. 830 South Spring Street, Springfield, IL 62704. Voice/TTY (800) 852-4302 or (217) 785-1364; Fax (217) 524-5339; E-mail: eciclearinghouse@eosinc.com. PRICE: Single copy free.

AB This bibliography from the Early Childhood Intervention Clearinghouse lists materials on children with deafness or hearing impairments. The Early Childhood Intervention Clearinghouse is a project of the Illinois Public Health Association. The materials listed in the bibliography are available for loan. The journal and newsletter articles, videotapes, and books are listed alphabetically by author (or title, if there is no author). Three hundred fourteen items are listed on topics including accessibility, mainstreaming, peer interaction, language processing, child development, language development, psychosocial factors, sign language, communication strategies, education, family interactions, otitis media, amplification and hearing aids, developmental disabilities, early intervention, early identification, multicultural issues, cued speech, cochlear implants, Deaf culture, audiology, listening skills, play, total communication, multiple disabilities, symptoms of hearing loss, deaf-blindness, and noise-induced hearing loss. Each item offers standard bibliographic information (author, title, date of publication, pages, source).

Document 9

TI Determining Therapy Needs.

AU Srinivasan, P.

SO In: Srinivasan, P. Practical Aural Habilitation: For Speech-Language Pathologists and Educators of Hearing-Impaired Children. Springfield, IL: Charles C Thomas Publisher, LTD. 1996. p. 69-107.

AV Available from Charles C Thomas Publisher, LTD. 2600 South First Street, Springfield, IL 62794-9265. Voice (800) 258-8980 or (217) 789-8980; Fax (217) 789-9130. PRICE: $65.95 (cloth); $41.95 (paper); plus shipping and handling. ISBN: 039806573X (cloth); 0398065748 (paper).

AB This chapter is from a manual that deals with the development of spoken language in children who are hearing-impaired. This chapter discusses the variety of factors that contribute to the success of an aural habilitation program. Aural habilitation is defined as the process of helping a child develop verbal communication skills by providing a learning environment that maximizes the use of residual audition (hearing). Factors covered include the age when heairng loss was identified, prompt amplification, cognitive abilities, parental involvement, the child's motivation, the presence of additional disabilities, the consistency of therapy approach, and the commitment of educators (particularly classroom teachers) to aural habilitation. The author then outlines the issues that are addressed during the aural habilitation assessment, including individual versus group therapy, classroom placement and frequency of therapy, the need for parent training, peer interaction, and the effectiveness of ongoing therapy. The author then describes the formal and informal tools of assessment in the areas of speech skills, auditory skills, cognitive skills, receptive and expressive language skills, conversational skills, peer interaction, and parent-child interaction. A final section addresses service delivery issues. 1 figure. 6 tables. 12 references.

Document 10

TI Early Identification and Management of Hearing Impairment.

AU Buttros, S.L.; Gearhart, J.G.; Peck, J.E.

SO American Family Physician. 51(6): 1437-1446. May 1, 1995.

AB In this article, the authors remind readers of the positive impact of the early detection and treatment of hearing loss in children. They stress that the family physician is in an excellent position to identify hearing impairment at an early stage. Topics covered include office-based evaluation, including physical examination and tympanometry; auditory function tests, including behavioral observation audiometry, the Crib-O-Gram, auditory brainstem response (ABR), otoacoustic emissions testing, visual reinforcement audiometry, conditioned play audiometry, and conventional audiometry; and intervention considerations. One chart summarizes the potential neurodevelopmental-behavioral complications of various levels of hearing loss. 1 figure. 5 tables. 18 references.

Document 11

TI **Early Intervention.**

AU Goldberg, D.M.

SO In: Martin, F.N.; Greer Clark, J., eds. Hearing Care for Children. Needham Heights, MA: Allyn and Bacon. 1996. p. 287-302.

AV Available from Allyn and Bacon. 160 Gould Street, Needham Heights, MA 02194-2310. (800) 278-3525; Fax (617) 455-7024; E-mail: AandBpub@aol.com; http://www.abacon.com. PRICE: $59.00 plus shipping and handling. ISBN: 0131247026.

AB This chapter on early intervention is from a textbook that focuses on the provision of hearing care for children with hearing loss. The author emphasizes that the early detection, identification, and management of infants, toddlers, and children with hearing disorders is crucial to maximize intellectual growth and speech and language development. Topics covered include the variables of hearing impairment, diagnostic considerations, amplification and audiologic management, family counseling, communication methodologies (including the auditory-verbal approach, cued speech, oralism, the Rochester method, total communication, the verbotonal method, American Sign Language, and manually coded English systems), factors affecting choice of communication methodology, communication assessment and intervention, auditory learning, speech, language, communication programs, instructional settings, and cochlear implants. The author concludes that early identification of hearing loss coupled with early and aggressive intervention to offset its effects are the only hope for developing oral and aural communication skills for children who have impaired hearing. 7 tables. 78 references.

Document 12

TI **Early Screening: A Promise for the Future.**

AU Short, L.

SO Hearing Health. 13(5): 26-27. September-October 1997.

AV Available from Voice International Publications, Inc. P.O. Drawer V, Ingleside, TX 78362-0500. Voice/TTY (512) 776-7240; Fax (512) 776-3278; http://www.hearinghealthmag.com.

AB This article emphasizes the importance of newborn hearing loss screening and describes a movement underway that provides hope for a brighter future for infants with hearing loss. Early identification and diagnosis of hearing loss is critical because stimulation is essential. If partial hearing exists, even infants as young as one month can be provided with amplification using the latest and tiniest hearing aids. The author describes the new technology which enables effective screening tests for neonates. Auditory brainstem response (ABR) testing utilizing new automated testing equipment is now cost-effective (eliminating the necessity for highly-trained technicians) and widespread for screening infants in the first 48 hours of life. The author also describes testing for evoked otoacoustic emissions (EOAE). This screening tool is based on a 1978 discovery that a healthy cochlea generates small, but detectable sounds (otoacoustic emissions) as a result of auditory stimulation. The author concludes by reporting on the success in some states of screening up to 90 percent of all newborns. In contrast, figures for the United States as a whole reflect a 15 percent screening rate. In addition, screening protocol in school-age children is far from universal. The author briefly outlines steps to take that will help achieve the goals established in the Healthy People 2000 project of the U.S. government.

Document 13

TI **Few Short Years That Can Last A Lifetime: Why Its Urgent That You Spot Any Hearing Loss in Your Child.**

SO New York, NY: Deafness Research Foundation. 199x. 2 p.

CN Deafness Research Foundation (DRF).

AV Available from Deafness Research Foundation. 15 West 39th Street, New York, NY 10018-3806. Voice/TTY (800) 535-3323 or (212) 684-6556. Fax (212) 765-1782; E-mail: drfl@village.ios.com. PRICE: Single copy free.

AB This parent education brochure provides information about early identification of hearing loss in children. The author explains the impact that hearing loss has on speech and language development in young children. Topics include a time table for normal speech development, the role of ear infections and the resulting temporary hearing loss, risk factors and screening programs for infants, and the role of early intervention programs for children who have hearing loss. The brochure concludes by emphasizing the important role parents can play in identifying and treating a child's hearing loss.

Document 14

TI **Giving Children a Sound Beginning: The Promise of Universal Newborn Hearing Screening.**

AU Maulk, G.W.; White, K.R.

SO Volta Review. 97(1): 5-32. Winter 1995.

AB In this article, the authors focus on the positive aspects of universal newborn hearing screening. Topics covered include the early identification of hearing loss; the consequences of delayed identification of hearing loss; federal and state government involvement in early identification of hearing loss; common methods used to screen for hearing loss at an early age; the promise of universal newborn hearing screening using transient evoked otoacoustic emissions (TEOAEs); TEOAE-based newborn hearing screening in the U.S.; universal newborn hearing screening as a gateway to early intervention for infants and young children with hearing losses; and a model of community-based, family-centered, coordinated and multidisciplinary services. 1 figure. 2 tables. 145 references.

Document 15

TI **How Does Your Child Hear and Talk?**

SO Rockville, MD: American-Speech-Language-Hearing Association (ASHA). 199x. [4 p.].

CN American Speech-Language-Hearing Association (ASHA).

AV Available from American Speech-Language-Hearing Association. ASHA Product Sales, 10801 Rockville Pike, Rockville, MD 20852-3279. (800) 897-5700, ext 218; Fax (301) 897-7358. PRICE: Single copy free; bulk orders available. Item Number 0210106.

AB This brochure provides basic information for parents about the development of language in children. The bulk of the brochure consists of a chart noting speech and hearing development milestones at different ages, from birth through age 5. Simple questions help parents to determine if their child is developing speech and hearing normally or if they should seek professional help. The brochure also offers suggestions for parents to help their child develop good speech, language, and hearing. Resources for help with speech, language, and hearing problems are listed. The brochure concludes with a list of other brochures available from ASHA. The brochure is illustrated with full-color photographs of parents and children in every day activities and receiving hearing tests.

Document 16

TI **Identification and Evaluation of Hearing Loss in Infants and Preschool Children.**

AU Dalebout, S.D.

SO In: Wall, L.G., ed. Hearing for the Speech-Language Pathologist and Health Care Professional. Woburn, MA: Butterworth-Heinemann. 1995. p. 103-140.

AV Available from Butterworth-Heinemann. 225 Wildwood Avenue, P.O. Box 4500, Woburn, MA 01801-2041. (617) 928-2500; Fax (617) 933-6333. PRICE: $45.00 plus shipping and handling. ISBN: 0750695269.

AB This chapter on the identification and evaluation of hearing loss in infants and preschool children is from a textbook that covers the physiology of the auditory system, hearing assessment, hearing disorders, hearing aids, hearing conservation, and aural rehabilitation of children and adults. Topics covered include the importance of early identification, screening techniques and practices, the high-risk register, behavioral observation screening, the Crib-O-Gram, auditory brainstem response (ABR) audiometry, otoacoustic emissions, universal screening, visual reinforcement audiometry, tangible reinforcement operant conditioning audiometry, conditioned play audiometry, immittance audiometry, early intervention, guidelines for neonatal hearing screening, the role of the Individuals With Disabilities Education Act (IDEA) and required special education services, guidelines for the clinical audiologic assessment of infants and young children, making audiologic referrals, and understanding the pediatric audiologic assessment report. 4 tables. 69 references.

Document 17

TI **Is My Baby's Hearing Normal?**

SO Alexandria, VA: American Academy of Otolaryngology-Head and Neck Surgery, Inc. (AAO-HNS). 1996. [2 p.].

CN American Academy of Otolaryngology-Head and Neck Surgery, Inc. (AAO-HNS).

AV Available from American Academy of Otolaryngology-Head and Neck Surgery, Inc. (AAO-HNS). One Prince Street, Alexandria, VA 22314-3357. (703) 836-4444; Fax (703) 683-5100; http://www/entnet.org. PRICE: Single copy free; bulk rates available. Item Number 4763410.

AB This brochure provides a simple checklist to help parents take stock of their baby's hearing and risk factors for hearing loss. The author stresses that early diagnosis, early fitting of hearing aids, and an early start on special educational programs can help maximize a child's existing hearing and reduce speech and language difficulties. The checklist notes risk factors for activities during pregnancy and during the neonatal and infant periods. A second section asks questions related to the child's response to the environment (speech and language development). The brochure also explains to parents how to evaluate their own responses to these questions and where to obtain assistance and additional information. The brochure stresses that the checklist is not a substitute for an ear examination or a hearing test. Hearing loss can exist in children even though none of the checklist items are present. The checklist is written in nontechnical language.

Document 18

TI **Joint Committee on Infant Hearing: 1994 Position Statement.**

SO Bulletin [American Academy of Otolaryngology-Head and Neck Surgery (AAOHNS)]. 13(12): center insert. December 1994.

CN Joint Committee on Infant Hearing.

AB This 1994 Position Statement was developed by the Joint Committee on Infant Hearing. This committee endorses the goal of universal detection of hearing loss as early as possible. According to the Position Statement, all infants with hearing impairment should be identified before 3 months of age, and receive intervention by 6 months of age. After a background section, the Statement discusses considerations for detecting hearing loss in infants, including technical considerations, personnel, implementation, and cost-benefit analysis; indicators associated with sensorineural and/or conductive hearing loss; and early intervention services. 62 references.

Document 19

TI **Listening and Auditory Skills.**

AU Martin, K.L.

SO In: Martin, K.L. Does My Child Have a Speech Problem? Chicago, IL: Chicago Review Press. 1997. p. 37-55.

AV Available from Chicago Review Press. 814 North Franklin Street, Chicago, IL 60610. (312) 337-0747; Fax (312) 337-5985. PRICE: $16.95 plus shipping and handling. ISBN: 1556523157.

AB This chapter on listening and auditory processing skills is from a guide that helps parents and teachers identify normal speech development and potential speech and language problems in children. Auditory processing refers to the ability to listen, accurately comprehend, and respond to spoken information, from the initial detection of sound or speech by the external ear to the transmission of that sound via the auditory pathways to the brain. The chapter is written in a question-and-answer format, covering topics including identifying hearing loss and auditory processing deficits, the difference between hearing and auditory processing, behaviors typical of children who have auditory processing deficits, identifying attention deficit disorder (ADD), the impact of auditory processing disorders in the classroom setting, how auditory processing disorders affect language skills, what to expect after a child has been diagnosed with an auditory processing disorder, the difference between long-term and short-term auditory memory, and how parents can help their children develop good listening and auditory processing skills. After each section, the author offers related strategies for the parents to employ.

Document 20

TI Middle-Ear Disease (Otitis Media).

AU Blackman, J.A.

SO In: Blackman, J.A. Medical Aspects of Developmental Disabilities in Children, Birth to Three. Frederick, MD: Aspen Publishers, Inc. 1997. p. 189-193.

AV Available from Aspen Publishers, Inc. 7201 McKinney Circle, Frederick, MD 21704. (800) 638-8437; Fax (301) 417-7650. PRICE: $40.00 plus shipping and handling. ISBN: 0834207591.

AB This chapter, from a early childhood textbook on the medical aspects of developmental disabilities in young children (birth to age three), outlines concerns related to middle ear disease (otitis media). Otitis media is an inflammatory disease of the middle ear, common in children under six years of age. The author defines two types of otitis media: acute otitis media, characterized by a red, bulging, immobile eardrum, ear pain, and bacteria and pus in the middle ear; and serous otitis media (or otitis media with effusion, OME), a more chronic condition that includes fluid in the middle ear space, which can result in varying degrees of hearing loss. Topics covered include incidence, etiology (cause), detection, course, accompanying health problems, medical management, and implications for early intervention. The most prudent course at the present time is to treat acute infections with appropriate antibiotics, to follow the status of the middle ear with pneumatic otoscopy or impedance tympanometry, and to consider various treatments for recurrent acute infections and persistent serous fluid in the middle ear. The author concludes that, because of the age group served and the types of disabilities encountered, ear infections are common in children participating in early education and therapeutic programs. Teachers and therapists must understand the nature of otitis media and appreciate its impact on health and developmental function.

Document 21

TI New Directions in Infant Hearing Screening.

AU Trace, R.

SO ADVANCE for Speech-Language Pathologists and Audiologists. 6(15): 6-7, 18. April 15, 1996.

AV Available from Merion Publishers, Inc. 659 Park Avenue, Box 61556, King of Prussia, PA 19406-0956. (800) 355-1088 or (610) 265-7812.

AB This article, from a professional newsletter for speech-language pathologists and audiologists, explores new directions in infant hearing screening. Topics covered include otoacoustic emission (OAE) testing, auditory brainstem response (ABR) protocols for hearing screening programs, differential diagnosis, visual reinforcement audiometry (VRA), clinical research investigating the various screening techniques, problems with time constraints, automated ABR systems, neonatal testing (particularly for those infants in intensive care), how each test fits into a comprehensive audiometric examination, training staff members to perform the automated ABR, and the use of OAE and ABR testing for older children. The article concludes with the addresses and telephone numbers of the researchers and clinicians interviewed in the article. 3 figures.

Document 22

TI **Parent-Infant Audiology in the 1990s: an Interdisciplinary Overview.**

AU Hoshko, I.M.

SO In: Johnson, C.D., ed. Educational Audiology Monograph. Tampa, FL: Educational Audiology Association. 1996. p. 28-34.

AV Available from Educational Audiology Association. 4319 Ehrlich Road, Tampa, FL 33624. (800) 460-7322; Fax (813) 968-3597. PRICE: $10.00 plus shipping and handling.

AB This paper describes the need for an interdisciplinary approach to early identification and intervention for infants with hearing impairment. The author discusses three issues: the need for effective interdisciplinary cooperation to realize early identification objectives; application of both research and clinical experience in advancing knowledge of infant auditory assessment; and the challenge faced by pediatric audiologists in the intelligent use of current and future assessment technologies. Successful pediatric assessments are dependent upon acute observational skills, speed and versatility, precision in measurement, and attention to logistics. The author also presents data on a Canadian population (n = 25) of infants and young children with hearing impairment. 4 tables. 52 references.

Document 23

TI **Pediatric Amplification: Use and Adjustment.**

AU Ross, M.

SO In: Martin, F.N.; Greer Clark, J., eds. Hearing Care for Children. Needham Heights, MA: Allyn and Bacon. 1996. p. 233-248.

AV Available from Allyn and Bacon. 160 Gould Street, Needham Heights, MA 02194-2310. (800) 278-3525; Fax (617) 455-7024; E-mail: AandBpub@aol.com; http://www.abacon.com. PRICE: $59.00 plus shipping and handling. ISBN: 0131247026.

AB This chapter on the use and adjustment of pediatric amplification is from a textbook that focuses on the provision of hearing care for children with hearing loss. The author emphasizes that amplification (hearing aids) serves a different role for children and adults. For adults, hearing aids are used to support a linguistic code they already know. For children, hearing aids are used in support of language development. The author writes on the assumption that amplified sound is the most effective therapeutic tool for minimizing or averting the usual linguistic and educational ramifications of a hearing loss in a child. While the benefits of an amplified speech signal will vary with the degree of hearing loss, some auditory contributions can almost always be realized. Topics covered include the identification of hearing loss, the first hearing aid, setting appropriate amplification targets, fitting earmolds, age as a factor in fitting, troubleshooting problems with hearing aids, communication strategies, the role of parents and family members, and the role of teachers. The author concludes that the process of selecting amplification and ensuring that the selected devices are working properly is the beginning and not the end of working with children who have hearing loss. Everyone involved in the education of the child with hearing loss must be informed and convinced of the value of amplified sound. 4 figures. 1 table. 28 references.

Document 24

TI **Position Statement: Early Identification of Hearing Loss in Infants and Children.**

AU Northern, Jerry, et al.

SO Washington, DC: American Academy of Audiology (AAA). 1994. [8 p.].

CN American Academy of Audiology (AAA).

AV Available from American Academy of Audiology (AAA). 1735 North Lynn Street, Suite 950, Arlington, VA 22209-2022. (800) AAA-2336 or (703) 524-1923; Fax (703) 524-2303. PRICE: Single copy free.

AB This position statement from the American Academy of Audiology covers early identification of hearing loss in infants and children. The Academy endorses the goal of universal detection of newborns with hearing loss; identifies considerations for detecting hearing loss in infants; and emphasizes the importance of early, appropriate, family-centered intervention for infants with hearing loss. Topics covered include statistics on the magnitude of the problem, the impact of hearing loss on language skills, screening for infants and children, and the role of the audiologist. 62 references.

Document 25

TI **Research, Training, Key Activities for Government Agency: A Look at the National Institute on Deafness and Other Communication Disorders.**

AU Haines, J.

SO Silent News. 27(9): B1, B4-B5. September 1995.

AV Available from Silent News, Inc. 133 Gaither Drive, Suite E, Mount Laurel, NJ 08054-1710. Voice (609) 802-1977; TTY (609) 802-1978; Fax (609) 802-1979; E-mail: silentnews@aol.com.

AB This article summarizes the activities of the National Institute on Deafness and Other Communication Disorders (NIDCD). One of the 17 institutes of the National Institutes of Health (NIH), the NIDCD's mission is to conduct and support research and research training on normal and disordered mechanisms in the seven areas of hearing, balance, smell, taste, voice, speech, and language. The article briefly reviews the history of NIDCD and then discusses the grants and research activities of the Institute, focusing on those activities directly relating to hearing and deafness. Research programs covered include research in the areas of hearing, language acquisition and use; Usher Syndrome and its genetics; minority student participation; collaborative programs between the NIH and academic centers, including Gallaudet University; the work of Bill Stokoe on American Sign Language (ASL); noise-induced hearing loss; the early identification of hearing loss in children and infants; and public information and awareness campaigns. The article concludes with details about the NIDCD Information Clearinghouse and how readers can access the Clearinghouse's resources.

Document 26

TI **Sensorineural Hearing Loss in Children.**

AU Brookhouser, P.E.

SO Pediatric Clinics in North America. 43(6): 1195-1216. December 1996.

AB This article reviews the epidemiology, etiology, diagnosis, and treatment of sensorineural hearing loss (SNHL) in children. The article begins with a brief discussion of the social and educational impact of an undetected hearing loss in infants and young children, then reviews the goals of universal screening and hearing loss detection. The author notes that an optimal protocol for universal screening would permit infants with normal hearing to be accurately segregated from those with true positive results who need expensive follow up and would help identify neonates with transient conducive hearing losses, sparing them the necessity of follow-ups. The article goes on to discuss the causes of SNHL, the use of a multidisciplinary team evaluation, the measurement of hearing (using evoked otacoustic emissions, or OAE, and other methods), and the advances in understanding the genetics of hearing loss. The remainder of the article considers the nongenetic causes of hearing loss, including congenital cytomegalovirus infection, congenital toxoplasmosis, congenital syphilis, rubella, measles and mumps, herpes simplex encephalitis, bacterial meningitis, toxic drugs and chemicals, hypoxia and anoxia, hyperbilirubinemia, recurrent otitis media, neonatal intensive care, ear or temporal bone trauma, perilymph fistula, and noise-induced hearing loss. 3 tables. 79 references.

Document 27

TI **Silence Isn't Always Golden.**

SO Bethesda, MD: NIDCD Information Clearinghouse. 1994. (brochure and 2 cards).

CN NIDCD Information Clearinghouse.

AV Available from NIDCD Information Clearinghouse. 1 Communication Avenue, Bethesda, MD. 20892-3456. Voice (800) 241-1044; TTY (800) 241-1055. PRICE: Single copy free; bulk orders available. Item Number DC-112.

AB This brochure encourages parents to be aware of their baby's hearing and to talk with a health care provider about any concerns they may have. It includes two cards: a baby's hearing checklist, consisting of questions categorized by the baby's age (birth to 3 months, 3 to 6 months, and 6 to 10 months); and a list of questions to answer and discuss with the baby's doctor. Questions cover family history of hearing problems; birth history; problems with ear infections; and medical history, including experience with scarlet fever, allergies, or meningitis. A brief glossary of terms is also included. This brochure is available in English, Spanish and Vietnamese versions. There is also a special version designed for Native Americans.

Document 28

TI **Why His Hearing Depends on Your Listening.**

SO Omaha, NE: Boys Town National Research Hospital (BTNRH). 199x. (poster).

CN Boys Town National Research Hospital (BTNRH).

PD 1 poster (11 in x 18 in).

AV Available from Boys Town National Research Hospital (BTNRH). Information Dissemination, 555 North 30th Street, Omaha, NE 68131. Voice (402) 498-6749; TTY (402) 498-6543. Also available from National Institute on Deafness and Other Communication Disorders (NIDCD) Information Clearinghouse. 1 Communication Avenue, Bethesda, MD 20892-3456. Voice (800) 241-1044; TTY (800) 241-1055; Fax (301) 907-8830; E-mail: nidcd@aerie.com; http://www.nih.gov/nidcd. PRICE: Single copy free.

AB This black and white poster encourages parents to include hearing testing in their regular child health care and prevention strategies for care of an infant. The text of the poster discusses the symptoms of hearing loss in infancy and the expected behaviors for infants with normal hearing at 3 months, 6 months, 9 months, 12 months, 18 months, and 24 months. The checklists note listening behaviors, speech development stages, and other physical milestones that can be expected at each age. The poster features black and white photographs of infants and a father. The poster includes toll free telephone numbers (voice and TTY) for obtaining more information.

Document 29

TI **Your Baby's Hearing: What Every Parent Should Know.**

SO Lincoln, NE: Nebraska Speech Language Hearing Association (NSLHA). 199x. 2 p.

CN Nebraska Speech Language Hearing Association (NSLHA).

AV Available from Nebraska Speech Language Hearing Association (NSLHA). 1033 K Street, Lincoln, NE 68508. (402) 476-9573. PRICE: Single copy free.

AB This parent education brochure emphasizes the importance of a baby's hearing to the development of speech and language. The brochure lists typical responses in babies with normal hearing at different ages, from newborn to approximately 12 months. The brochure also notes conditions or risk factors that may be associated with hearing loss. Finally, the brochure describes hearing tests that can be performed on infants and the overall importance of early identification and intervention in hearing loss. The brochure is illustrated with colorful line drawings of parents and babies.

Document 30

TI **1996 Publications Catalog.**

SO Washington, DC: Alexander Graham Bell Association for the Deaf. 1996. 32 p.

CN Alexander Graham Bell Association for the Deaf.

AV Available from Alexander Graham Bell Association for the Deaf. Publication Sales Department, 3417 Volta Place, NW, Washington, DC 20007-2778. Voice/TTY (202) 337-5220; Voice (202) 337-8767; Fax (202) 337-8370. PRICE: Single copy free.

AB This catalog lists texts, brochures, audiovisual materials, and software available in the field of auditory-oral education from the Alexander Graham Bell Association for the Deaf. The A.G. Bell Association is dedicated to empowering persons with hearing impairments to function independently by promoting universal rights and optimal opportunities to learn and maintain verbal communication. Publications are listed in 14 categories: audiological management and auditory training, amplification options, assistive technologies, language and speech acquisition, early identification of hearing loss in young children, medical information, communication approaches, curriculum, educational management and mainstreaming, parents and families, legal issues, consumer information, oral interpreting, and speechreading. The catalog includes ordering information and prices, as well as membership information for the A.G. Bell Association.

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